MODIS Team Meeting Minutes

Minutes of the MODIS Team Meeting held on Tuesday February 14, 1995.

Action Items:

94. Provide a detailed (high fidelity) analysis of scatter in the scan cavity. The results would determine the need for PF near field scatter measurements vs scan angle. Assigned to Guenther 8/23/94 Preliminary results due 10/15/94. Final due 2/28/95.

108. Prepare a report addressing the status of the MODIS Reliability Program. Reliability elements will include: FMEA, Worst Case, CIL, Reliability Assessment and Parts Device Stress Analysis and Trend Analysis. Assigned to Silva 1/ 3/94. Due 1/17/95

109. Determine if there are any technical problems associated with the different instrument orientations with respect to gravity when testing MODIS at SBRC versus testing MODIS at the spacecraft integrator. Assigned to Roberto 1/10/95. Due 2/13/95 CLOSED 2/17/95

110. Write up the disposition of the reduced -5°C torque margin on the scan mirror, given increasing torque requirement of test bearings. If the decision is to accept as is, document the rationale. Assigned to Roberto 1/17/95. Due 1/31/95

111. Recommend an optical design for the diffuser screen. Assigned to Waluschka 1/31/95. Due 2/28/95

112. Analyze the ScMA optical design. Assigned to Waluschka 1/31/95. Due 2/ 7/95

Attendees:

✓ Richard Weber	Bruce Guenther	Larissa Graziani
✓ John Bauernschub	✓ George Daelemans	✓ Bob Martineau
✓ Rosemary Vail	Patricia Weir	Bob Silva
Lisa Shears	✓ Mitch Davis	✓ Robert Kiwak
✓ Mike Roberto	✓ Ken Anderson	✓ Harvey Safren
✓ Nelson Ferragut	✓ Rick Sabatino	Ed Knight
✓ Gene Waluschka	✓ Cherie Congedo	✓ Harry Montgomery
Bill Barnes	✓ Jose Florez	Marvin Maxwell
Les Thompson	✓ Gerry Godden	Bill Mocarsky
✓ John Bolton	✓ Sal Cicchelli	✓ Helen Phillips
✓ Pat Delosa		

The following items were distributed:

1) Weekly Status Report #176
2) SBRC Memos submission from week #168
3) Minutes of the previous team meeting

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MODIS Technical Weekly   17 February 95

Sent out 2/17/95 at about 4:45 PM to MODIS.REVIEW?

1. General

Bill Mocarsky is at SBRC this week. Ken Anderson, Rick Mills, and Mike Roberto will be at SBRC next week.

On February 14, Ed Knight went over his presentation materials for the AM-1 Operations Workshop with Bruce Guenther, Claire Wilda, and Mike Roberto. The workshop will be held at the Hughes facility at Landover, MD
on February 21-23, 1995.

2. Bill Mocarsky and David Jones (EM SI&T) From: David Jones 2/15/95 7:29 PM

This report is the collective input from Jones and Mocarsky of the most recent development in the EM SI&T activity.

OASIS 12 Problem really a PVWave Problem:
Further investigation indicates that the GSE crashes are not a function of OASIS 12. The problem is with the PVWave. SBRC has sent their PVWave S/W interface code to the vendor for review and an OK. Bill Mocarsky feels that the problem is that when PVWave "exits" it does not free-up memory.

Bill suggests that Martin Marietta be informed of the PVWave problem
since it may also exist in their GSE system. Perhaps it should be simply an Alert until SBRC finds the solution.

The OASIS Problem is now renamed as "PVWave problem" and hopefully, SBRC reports will use this term.

SI&T Status:
a) Taxi Error Flag: The malfunction causing "Taxi errors to be flagged at 551 sec intervals has been fixed. It was cause by an Interrupt Routine exceeding the allowable execution time. The S/W was modified to reduce the execution time.

b) FIFO Jitter problem: This has been solved by reducing the interpacket time gap for the last packet processed.

Still not fully resolved are:

c) FDDI FIFO Swap error: This error shows as a failure of either FIFO to fully empty during a swap routine. This may be fixable (as an EM fix) by a small modification to the H/W in the MEM (addition of a decoupling capacitor). The solution details are TBD. This conclusion is based on the observation that attaching logic analyzer leads results in correct FIFO swap. Removing analyzer probes make the error return. (Please! - No jokes about flying the logic analyzer probes).

d) FBAD Packet Gap problem: This is considered to be caused by an interface problem between the FIFOs, internal to the Formatter and the 1750A. Apparently, the FIFOs remember an initialization value for the gap time on FIFO swap (not to be confused with the FDDI FIFO swap) even though the S/W has

updated the value. A S/W work-around this problem initializes the gap time to the correct value. This may be acceptable for the EM TV tests, but is not acceptable in the long term because the exact cause of the problem is not understood.

SI&T Schedule:
An update of the schedule will be transmitted to GSFC on Friday 17 Feb.

End of David Jones' report.
-- Summary of portion of phone message from Bill Mocarsky 2/16/95 8 PM:

With the SAM all powered up, system works fine. Turn off the SAM, and the FIFO swap and FIFO jitter problems return. Tests will be run for several hours or overnight. The issue is that although the system can be made to work, it is not understood why it works.
-- Additional Notes:
There is also a concern that some components may run too hot in thermal vacuum. Better heat sinking of some EM electronics may be needed before T/V. See Paul Bortfeldt's memo "Status of Electronics Thermal Testing", W04663, 2/1/95.

Bill mentioned that The FIFO jitter/swap may be the same issue. Put a scope on and the system works. Turn on the SAM and the system works. If the SAM is turned off or disconnected, the system slowly fails.

Bill Mocarsky and David Jones mentioned MEM operated for several hours the night of 2/16/95 without an error in a telecon on 2/17/95. SBRC made the decision to integrate the MEM into the mainframe. Electrical checkout of the MEM will continue.

3. Systems and Calibration Telecon

The following is from Tom Pagano:
Minutes from the NASA telecon of February 13, 1995

Tom: Polarization data, -45 degrees, 45 degrees , 0 degrees on bands 1, 2, 3, 4, and 8. Data at 45 degrees on 13, and 14. Some band 6 data, but it has the bad filter on it and doesn't look realistic; i.e. we're seeing 6% polarization.

Neil. Flight software is interrupt driven and needs to be serviced in 333 us pixel time. Ada compiler came with a bunch of utility routines that wound up with assembly instructions that exceeded what we needed. Code optimized now, and the code keeps up with the pixel clock. Once it was fixed, it revealed a problem in the FIFO's. These take turns sending out data to the FDDI link. Fred and Joe were looking at this morning. Next thing is to look at cable related noise problems. Most of the noise we've seen so far is in the voltage regulators in addition to cabling.

Barnes: Same noise you've seen before?

Two categories for noise: Cable dependent jitter effects which are tunable with cable length; the other effect is on the SAM boards which causes the 240 Hz to 480 Hz noise. Two voltage regulators beating against each other. It can be seen on the real time display. That problem will be worked when the SAM board is integrated. Nothing we have found that is on the MEM side.

Godden. Are you going to filter more?

Neil. We will integrate the MEM with the flight cable lengths so we can tune the system. They were changing the resistor configuration on the voltage regulators.

Barnes. When will you look at the noise?

Neil. Three days before we can even look at noise testing.

Barnes. ScMA fill factor issue? Is the mirror overfilled. Are you getting scattering? What are you conclusions?

Young. Current plan is to have a special section of our test where we place a restrictive aperture on the ScMA source mirror and a small field aperture (1 x 1 1/2) pixels to ensure we are underfilling the ScMA collimator mirror. Measurements will be made with that configuration using the VIS/NIR integrated filter configuration. After we get that data, we will remove the restrictive aperture on the source mirror and now we are assured we are overfilling the collimator mirror. Another integrated set of data will be taken. That will hopefully show the magnitude of the effect in the VIS/NIR bands. When we take the remainder of the data, we will have a source slit which is 1 x 10 and we will replace the aperture on the source mirror. We are sure under that configuration there will be illumination of the collimator chamfer under some field angles.

Young: We have done some analysis w.r.t. the OBC blackbody. Portions at the end without the V-groove cavity. This analysis will be reported in a memo which is rough drafted now and should be out within a few days. Bottom line is that the OBC BB as will work.

Knight. Can you please fax a copy of it to me?

Young. A lot of thought on how to do the out-of-band analysis. I wrote up a set of equations and gave them to Sam. I believe we are converging.

Barnes. Analysis of the out-of-band?

Young. When we do MODIS Out-of-Band response measurements, we have to do it in a non-dispersive mode. Namely that our monochromator does not have enough energy for out-of-band measurements. We replace the gratings of our double monochromator with mirrors. We introduce numerous optical filters which cover significant spectral range outside the MODIS spectral band so we are getting an integrated out-of-band measurement. Believe now we have a realistic way of reducing the data and have minimized the number of measurements.

Barker. I assume the out-of-band measurements would not be integrated. Are you saying something different. I thought you 'd get a spectral profile.

Young. MODIS out-of-band should be 4 orders of magnitude less than the in-band peak. If you look at the sources available to us (relatively high temperature sources; e.g. incandescent source at 3000K, and IR ceramic source at 1700K) and when we factor in all of our transmission factors, there is a significant part of the spectral region where we'd have SNRs ranging from 3 or 4 to less than 1. These SNRs do not allow a meaningful measurement.

Knight. Scanning or Static?

Young. Static. Image of monochromator slit is on the MODIS band we are characterizing.

Zukowski. Max SNR of 4 based on what bandwidth of the OOB (Out-of-Band) response?

Young. When we did the SNR for OOB, what we tried to do analysis wise is open up the exit slit of the monochromator so it filled the MODIS IFOV. Now to open it up any further buys us nothing since the MODIS IFOV is the limiting factor. So we have obtained the largest spectral slit width to match the monochromator gratings.

Godden. Does it help to add the along track detectors?

Young. Yes that would help by a factor of 3. We do have a radiation chopper which we could take longer collects. There will be some bands wherein we will not have enough SNR even if we did all the things we can think of to use the monochromator in a dispersive mode.

Zukowski. Did you assume all of the out-of-band response within the slit width?

Young. No. If the MODIS were within spec, but simply very close to the spec, then the response of MODIS at the peak of the spectral band would be arbitrarily normalized to 1. Outside the extended bandpass surrounding the in-
band region, for all wavelengths, we'd have 0.001 response relative to the peak.

Barnes. Do you have piece part measurements on the filters and dichroics.

Knight. Yes on the filters, yes on the dichroics, but the problem is the mask.

Tom. I don't believe the piece part will be accurate enough to get the profile.

Young. The specification that we have onto ourselves is significantly more stringent than the one in the system spec.

Barker. We're aware that we cannot live with our spec.

Barnes. We'll tighten up on the spec next time.

Neil. Instruction changes did improve the efficiency. The software has about 150 to 200 us dead time in which is doing nothing. That is the margin right now.

Knight. Heads up regarding TAC. We are having problem with the printer function in the TAC software. Scatter/Stray light through the solar diffuser port. When you sent the fax to Gerry, you mentioned some concerns. What is the status?

Young. One of the major effects from the APART spurious response paths was the sun illumination of the calibration bulkhead. There was glancing light off that aperture and getting onto the solar diffuser. I believe in Terry's initial memo, that was about 2.7%. When he assumed that wall with the hole was painted black, and he also changed the shape of the wall to what he believed is the current configuration, that went

down to 2.5%. I can believe that if the solar diffuser sees a part of that wall edge, we will have a spurious response path. At the same time, I find it difficult to believe that we have that much stray light for that cause without appreciable scattering off the SRCA housing for the same model. That path is not among the top 10 contributors. I find that hard to believe. When I did a back of the envelope calculation assuming an integrating cavity in the forward enclosure, I came up with numbers well within the magnitude of the top 10 values. We need to pursue this more.

Godden. Any possibility of putting a thin aperture on the bulkhead.

Young. I hoped we could put a thin aperture on the bulkhead so that wall cannot be seen. We haven't looked at how much room we have.

Godden. When I look at the drawing that B. Cushman sent me, it looks like it is designed to take data between 10 degrees and 17 degrees . When I trace a 10 degrees ray and 17 degrees ray, I see a different amount of area on the diffuser being illuminated. Unvignetted from 12 to 13 degrees and vignetted from 13 degrees to 17 degrees .

Young. It seems to me there was a detailed mechanical analysis of the hole in the forward panel i.e. solar diffuser door and the calibration bulkhead and the solar diffuser and the areas that the solar diffuser is seen by MODIS.

Tom. It looks to me like we are overfilling the diffuser at 10 degrees . I don't see any vignetting. Diffuser is also oversized.

Young. We could put in a thin walled mask that would reduce the amount of light through the calibration bulkhead, but would still fill the diffuser in the way we want.

Godden. There looks like room for that. I still see a vignetting problem. What is the layout in the azimuth direction? From what Terry had in his report, where is the 2 1/2 % happening relative to azimuth.

Young. Terry has said he will run a significantly greater set of scattering angles.

Godden. What kind of signals would we get when we view cold space?

Young. Sounds like you are relating this to the calibration. Our analyses indicate that in order to reduce the calibration error down to a 1/4% we had to know the temperature our scan mirror to 1K.

Barnes. Want to measure the scan mirror output in orbit to allow for contamination effects. Looking at maneuvers for the s/c to allow us to measure this effect.

Knight. Need scan angle FOV results.

Barker. Need transfile values. Their ghosting analyses. Missing transmissions near the FPA. Questions on how the data is to be interpreted. Missing theoretical data or calculated for several of the FPAs.

Tom. We have modeled data for all the lenses.

Knight. I'll get together with John.

Barker. Still, a lot of that data is modeled. Are there any plans to collect data in the cavity as an alternative to measurements on orbit.

Barnes. On the flight model, if we wanted to look over a broader area of the backscan. How big a change in the software is that.

Neil. Table driven all of the sector locations. Provided he can change these values, it can be done straightforwardly. There may need to be sequence dependencies, and there is time in there for calculating DC restore parameters. It may be doable.

Tom. You can certainly scan the door.

Barnes. If we needed to instrument the door a little better, do you have additional thermistor ports?

Tom. I don't know.

Barnes. No teleconference next week. 2 weeks for next telecon.

End of Tom Pagano's report.

4. Al DeForrest (Comments on Systems Telecon)

You guys scare me. I read your discussion and noted that they are disconnected from the current state of the opto-mech hardware. For example, the orders for the next two mainframes have been negotiated and the contract will soon be let. There is no provision for modifying the calibration bulkhead nor are there features for attaching another wall. The message is this: while the MODIS team strives to gain as much knowledge about the EM as possible, the SI&T of the PFM is well underway. Design changes will come at an every increasing cost. Consolidated purchases will tend to amplify the magnitude of this cost.

5. Bob Martineau (Focal Plane Assemblies)

1) Testing of the LWIR PF detector assembly continues and is expected to be completed this week. The delivery schedule is driven by the filter/bezel assembly, which is expected 1 March. Delivery date for the FPA is scheduled for 13 March.

2) The PF SMWIR SCA S/N 109 will be installed on the motherboard this Tuesday. The backup SCA, S/N 110 has been tested, and documentation is being completed. S/N 109 is stated to meet specification. Delivery of the PF SMWIR FPA is expected to be 24 March.

3) For F1 and F2, the plan is to have tested by the end of May 9 SMWIR SCAs and 14 LWIR SCAs. PF VIS and NIR FPAs have been delivered. All VIS and NIR assets for F1 and F2 will be tested from April to June.

6. Cherie Congedo (Sine Vibration Testing)

It has been determined that notching will not be needed for the radiative cooler if we do a sine vibration test.

MR
2/17/95